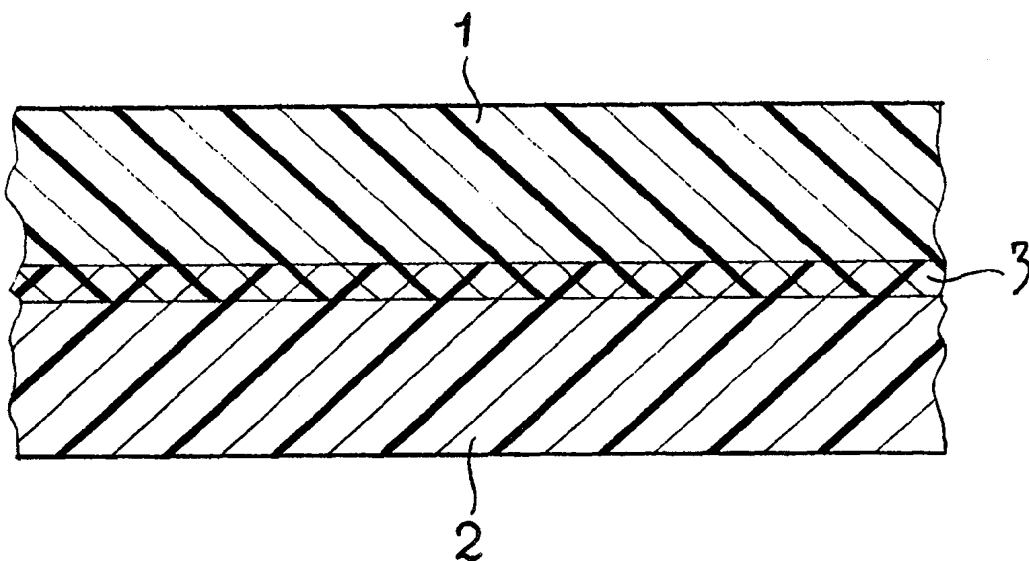


INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁷ : B32B 27/08, B65D 65/40, 81/34	A1	(11) International Publication Number: WO 00/38917 (43) International Publication Date: 6 July 2000 (06.07.00)		
<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top; padding: 5px;"> (21) International Application Number: PCT/NO99/00380 (22) International Filing Date: 15 December 1999 (15.12.99) (30) Priority Data: 19986070 23 December 1998 (23.12.98) NO (71) Applicant (for all designated States except US): DYNO INDUSTRIER ASA [NO/NO]; P.O. Box 779, Sentrum, N-0106 Oslo (NO). (72) Inventor; and (75) Inventor/Applicant (for US only): NYTRÖ, Morten [NO/NO]; Husbylia 19, N-7500 Stjørdal (NO). (74) Agent: CURO AS; P.O. Box 38, N-7231 Lundamo (NO). </td> <td style="width: 50%; vertical-align: top; padding: 5px;"> (81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i> <i>In English translation (filed in Norwegian).</i> </td> </tr> </table>			(21) International Application Number: PCT/NO99/00380 (22) International Filing Date: 15 December 1999 (15.12.99) (30) Priority Data: 19986070 23 December 1998 (23.12.98) NO (71) Applicant (for all designated States except US): DYNO INDUSTRIER ASA [NO/NO]; P.O. Box 779, Sentrum, N-0106 Oslo (NO). (72) Inventor; and (75) Inventor/Applicant (for US only): NYTRÖ, Morten [NO/NO]; Husbylia 19, N-7500 Stjørdal (NO). (74) Agent: CURO AS; P.O. Box 38, N-7231 Lundamo (NO).	(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i> <i>In English translation (filed in Norwegian).</i>
(21) International Application Number: PCT/NO99/00380 (22) International Filing Date: 15 December 1999 (15.12.99) (30) Priority Data: 19986070 23 December 1998 (23.12.98) NO (71) Applicant (for all designated States except US): DYNO INDUSTRIER ASA [NO/NO]; P.O. Box 779, Sentrum, N-0106 Oslo (NO). (72) Inventor; and (75) Inventor/Applicant (for US only): NYTRÖ, Morten [NO/NO]; Husbylia 19, N-7500 Stjørdal (NO). (74) Agent: CURO AS; P.O. Box 38, N-7231 Lundamo (NO).	(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> <i>Before the expiration of the time limit for amending the</i> <i>claims and to be republished in the event of the receipt of</i> <i>amendments.</i> <i>In English translation (filed in Norwegian).</i>			
(54) Title: BI-LAYER PLASTIC CONTAINER				
				
(57) Abstract <p>Container of twin-layer plastic, especially to be used in catering. An inner layer (1) is formed of a stain resistant plastic material, e.g. polyetherimide, polyether sulphone or polyphenyl sulphide, and an outer layer (2) is formed from a heat durable plastic material, e.g. liquid crystal polymer, aromatic polyketone, polyarylate, polyphthalamide or poly(cyclo hexylene dimethylene terephthalate). The layers should be at least 0,3 mm thick, preferably 1,4 mm, and the total thickness of the layers should be at least 1 mm, preferably 2,5 – 3,0 mm.</p>				

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece			TR	Turkey
BG	Bulgaria	HU	Hungary	ML	Mali	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MN	Mongolia	UA	Ukraine
BR	Brazil	IL	Israel	MR	Mauritania	UG	Uganda
BY	Belarus	IS	Iceland	MW	Malawi	US	United States of America
CA	Canada	IT	Italy	MX	Mexico	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NE	Niger	VN	Viet Nam
CG	Congo	KE	Kenya	NL	Netherlands	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NO	Norway	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	NZ	New Zealand		
CM	Cameroon	KR	Republic of Korea	PL	Poland		
CN	China	KZ	Kazakhstan	PT	Portugal		
CU	Cuba	LC	Saint Lucia	RO	Romania		
CZ	Czech Republic	LI	Liechtenstein	RU	Russian Federation		
DE	Germany	LK	Sri Lanka	SD	Sudan		
DK	Denmark	LR	Liberia	SE	Sweden		
EE	Estonia			SG	Singapore		

Bi-layer plastic container

The invention relates to a container of twin-layer plastic.

5 Background

Plastic containers for holding different materials, such as food, have been on the market for a long time. The problem with known containers is that they do not meet all the demands of being an effective food container, e.g. where food is to be both heated and eaten, from the same container. An effective food container must be durable towards both heat and discolouring. If it is not durable towards discolouring, staining, it will be stained during use, and thereby limit the number of times it is possible to use the container, since service/cooking of food on a stained foundation, will be considered both unhygienic and unappetizing. The container should also be usable in microwaves and ordinary ovens, and be able to be washed in dishwashers. It should therefore be chemical resistant towards dishwashing liquids of different kinds. As it should be used at least 20-30 times, the colour should not fade either. In addition, such a container should be simple and economic to produce, and meet applicable standards from, for example FDA and BGA.

For a long time, different materials have been tried in order to produce such containers, until now, no materials with satisfying qualities have been found. No known materials are both satisfyingly heat and stain durable.

Object

The main object of the present invention, is therefore to provide a container that can be used as an effective food container, especially for food which is to be heated. It is a particular object to provide a container that can withstand high temperatures, so that it may be used in an oven, but that also can be produced at reasonable costs.

The invention

The object is fulfilled with a container according to the characterizing part of patent claim 1. Further features are given in the dependent claims.

The combination of the materials which are used in the container according to the invention, results in a container that meets all demands of an effective food container.

Example

The container will be described hereinafter, with reference to the figures which are illustrative only and not intended to be limiting to the invention, where

Fig. 1 shows, in cross section, a container according to the invention,

5 Fig. 2 shows an enlarged cross section of the wall of the container shown in Figure 1.

Figure 1 shows the cross section of the container, including an inner layer 1 and an outer layer 2 which are in contact with each other along the whole of the container. The container is configured with slightly sloping walls, in such a way that it is easier to stack, and thereby
10 occupies thereby minimal space when empty for transportation and storage.

The container is twin-layered, an enlarged cross section is shown in Figure 2, where the outer layer 2 is of a heat durable plastic, such as LCP (liquid-crystal-polymer), aromatic polyketones, polyarylates, polyphtalamides or poly(cyclohexylene dimethylene terephthalate). The inner layer 1, i.e. the layer which in use, is in contact with the food, is of a plastic that
15 is durable towards discolouring, staining, for example polyetherimide, polyphenylsulphide, polyethersulphone or polysulphone.

Containers with the outer layer 2 of one of the stain durable materials which are mentioned above, and the inner layer of one of the heat durable materials which are mentioned above, can also be made. However, it will not be possible to use these several
20 times, in any case not 20-30 times. This is due to the fact that the heat durable material is not stain durable, and stains that are difficult to remove will therefore occur.

The ratio between the layers can be varied, and the characteristics of the container will vary accordingly. With a thin inner layer 1, the container can be used fewer times, and it will stain easily. If the outer layer 2 is reduced, the container will only withstand low
25 temperatures, and if it is increased, the temperature resistance will increase accordingly.

The ratio between the layers can be varied, but each layer 1,2 must at least be 0,3 mm thick, and the total thickness of the container wall must be at least 1 mm. The optimal thickness of each layer is about 1,4 mm, and the total thickness is optimal between 2,5 and 3,0 mm.

A container according to the invention can be produced by moulding one of the layers,
30 and then spraying or moulding the other on top. When the second layer is laid over, a thin layer of the first layer will melt on the interface 3 (contacting surfaces), and the materials will blend somewhat in a thin layer. The individual molecules will therefore get close to each other, and a strong bond between the layers will be obtained. The bond will be a combination of melting together, and chemical binding.

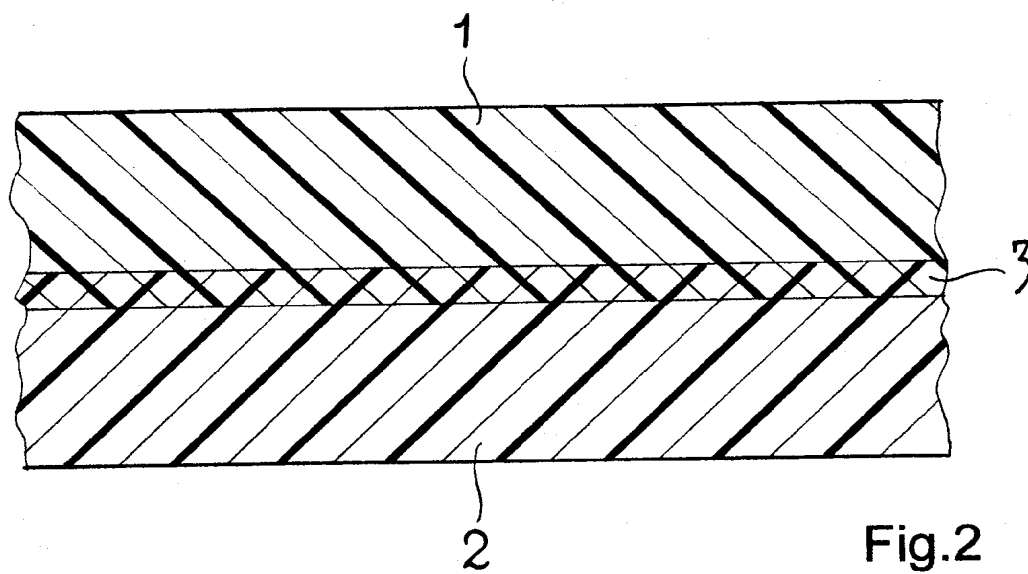
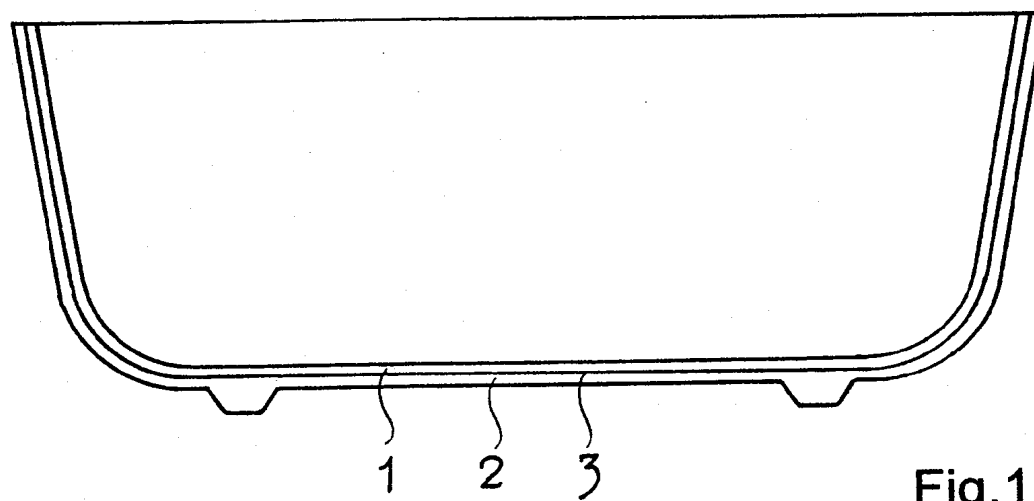
In case the second layer moulds over, the first layer will be moulded in a first mould, and then transferred to a second mould, where at least one part of the mould is a little larger than the first mould. The first layer will be fastened to the part of the mould, having the same size as the first mould, and the other layer will be moulded in the space which is
5 created between the first layer and the mould.

The containers which are shown in the figures were performed by moulding the first layer at 400°C. Then it was cooled to the right demoulding temperature (160°C) before it was moved to a new organ, which moulded the second layer over, at 330°C. After cooling, the container was finished, and could be used.

10 The container can withstand large temperature oscillations, and therefore it is preferable if the expansion coefficient for the two materials which are to be connected, are quite even. However, the chemical/thermal bond at the interface 3, is probably so strong that the container will not split even if it is produced from two materials with different expansion coefficients.

Claims:

1. Container of twin-layer plastics, especially for use in catering,
characterized in that
 - the inner layer (1) is chosen from one of the plastics which is durable towards
 - 5 discolouring; polyetherimide, polyethersulphone, polysulphone or polyphenylsulphide, and
 - the outer layer (2) is chosen from one of the plastics which is heat durable; liquid-crystal-polymer, aromatic polyketone, polyarylate, polyphtalamide or poly(cyclohexylene dimethylene terephthalate).
- 10 2. Container according to claim 1,
characterized in that the heat durable plastic is poly(cyclohexylene dimethylene terephthalate).
3. Container according to claim 1 or 2,
15 **characterized** in that each layer is at least 0,3 mm thick, and the total thickness of the container wall is at least 1 mm.
4. Container according to claim 3,
characterized in that each layer is about 1,4 mm thick, and the total thickness of the
20 container wall is 2,5 to 3,0 mm.
5. Method for producing a container according to any of the preceeding claims,
characterized in that firstly, one of the layers is moulded, and then the other layer is moulded or sprayed over.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 99/00380

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B32B 27/08, B65D 65/40, B65D 81/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B32B, B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0182029 A2 (GENERAL ELECTRIC COMPANY), 28 May 1986 (28.05.86), page 1, line 24 - line 32; page 5, line 30 - line 34; page 6, line 3 - page 7, line 2, claims; abstract	1,3-5
Y	--	2
Y	WO 9606125 A1 (EASTMAN CHEMICAL COMPANY), 29 February 1996 (29.02.96), page 1, line 24 - line 25	2
Y	EP 0166243 A2 (UNION CARBIDE CORPORATION), 2 January 1986 (02.01.86), page 2 - page 4, claims; abstract	1,3-5
	--	

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

26 April 2000

Date of mailing of the international search report

05 May 2000 (05.05.00)

Name and mailing address of the ISA:

Swedish Patent Office
Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Monika Bohlin/Els

Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 99/00380

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	File WPI, Derwent accession no. 1975-55375W, DU PONT DE NEMOURS & CO E I: "Polysulphone/ silicone resins compsn for coating metal vessels - for high quality bake ware, has decorative, non-stick, wear resistant props"; UST937005I I 19750805, DW197533 --	1,3-5
A	File WPI, Derwent accession no. 1989-237382, KURARAY CO LTD: "Heat-resistant oven container - consists of all-aromatic polyester capable forming optically anisotropic melt phase"; JP,A,1171515, 19890706, DW198933 --	1-5
A	File WPI, Derwent accession no. 1988-216689, ASAHI CHEM IND CO LTD: "Heat resisting film for wrapping food used in e.g. microwave oven - based on polyether-imide polymer"; JP,A,63152573, 19880625, DW198831 --	1-5
A	US 5124388 A (WAYNE P. PRUETT ET AL), 23 June 1992 (23.06.92), column 1, line 6 - line 45; column 3, line 61 - line 66 --	1-5
P,A	File WPI, Derwent accession no. 2000-042001, LINING CONTAINER KK: "Plastic container for manufacturing bread - comprises thermoformed amorphous sheet having poly 1,4-cyclohexylene dimethylene terephthalate and isophthalate resin"; JP,A,11279388, 19991012, DW200004 -- -----	1-5

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.

PCT/NO 99/00380

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
EP	0182029	A2	28/05/86	JP	61094758 A	13/05/86
				US	4737414 A	12/04/88

WO	9606125	A1	29/02/96	NONE		

EP	0166243	A2	02/01/86	NONE		

US	5124388	A	23/06/92	CA	2093005 A,C	14/02/93
				EP	0552171 A,B	28/07/93
				SE	0552171 T3	
				WO	9304111 A	04/03/93
